Building Research Establishment Digest

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Painting walls
Part 1: Choice of paint

Whilst some walls are inherently weatherproof and aesthetically acceptable, others are painted for a variety of reasons: to provide colour or surface texture, to waterproof them, to reflect or absorb light, to facilitate cleaning or for hygiene.

This two-part digest gives, in Part 1, guidance on the choice of paints and other coatings for internal and external walls according to the appearance and life required and the type of substrate. It discusses plasters, cement and concrete, bricks and stone, but excludes metal, wood and plastics. Part 2 gives information on the adverse factors which affect paint on wall surfaces and ways of identifying and remedying defects. The two digests together replace Digests 55, 56 and 57 which are now withdrawn.

It is recognised that users have difficulty in relating the types of paint described to commercial products but there are too many different makes of each type of paint for trade names to be quoted; in case of doubt the manufacturer should be contacted to verify that a particular paint is of the correct type required.

Characteristics of wall surfaces

Lime plasters

Non-hydraulic Now rarely used except in restoration work, they have a rather absorptive, mechanically weak surface when new and harden slowly on aging, sometimes with development of shrinkage cracks. When made with high purity lime and clean sand, they are free of soluble salts or caustic alkali and do not themselves saponify oil paints. They may react with salts (principally of sodium and potassium derived from a brick background for example) to form caustic alkali which could attack oil paints and some emulsion paints. Lime may be gauged with gypsum plaster to increase the hardness.

Limewash has been the traditional treatment but matt emulsion paints can be used provided that painting is delayed as long as possible (preferably at least a year) to permit drying, carbonation and development of strength. The porosity of these plasters is usually high and if well aged a penetrating sealer may be found helpful. Tough modern paints are generally unsuitable.

Hydraulic These are not often used as interior finishing plasters but may be used in exterior plasters or stucco. They have a variable caustic alkali content and can attack paints severely.

Gypsum (calcium sulphate) plasters

BS 1191 Part 1 *Gypsum building plasters,* distinguishes four classes of gypsum plasters and CP 211 *Internal plastering,* gives information on their use. Used neat, in the fully set, dry state they can be painted without difficulty using almost any type of paint. The porosity decreases and hardness increases from Class A to Class D. Adhesion of paint is usually good even on the denser plasters unless they are trowelled to a glazed surface but is seriously reduced by dampness, particularly on the denser type. Added lime (or cement in the backing coats) may cause development of alkalinity and necessitate the use of alkali-resistant primers or non-saponifiable paints.

Class A Plaster of Paris This is not normally used for plastering but is sometimes used in repairs and may be gauged with lime or lime and sand. For painting purposes it may be considered with Class B.

Class B Retarded hemi-hydrate plasters (eg 'Thistle') These have a smooth, hard but moderately porous surface to which paint adhesion is good but absorption of water-thinned paints is sometimes patchy. They contain small amounts of lime (greatest in metal lathing plasters) and are slightly alkaline but this is quickly reduced on aging. They do not usually affect paint unless there is an additional source of alkali behind them. Lime may be added but

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accelerates the set and increases the alkalinity (metal lathing plasters contain lime to reduce metal corrosion). Over-wetting during application may produce a powdery surface and in damp conditions (eg from condensation or moisture penetration from the rear) Class B plasters suffer from 'sweat out' leading to softening and consequent paint failure.

Class C Anhydrous plasters (*eg 'Sirapite'*) These are for finishing only. They are harder and less porous than Class B plasters. Over-trowelling can lead to a glazed surface with poor paint adhesion. They are slightly alkaline but the addition of lime (to improve workability) is common and this may react with the accelerating salts present making the plaster more likely to affect paint.
If allowed to dry out too quickly, anhydrous plasters may not hydrate fully, giving a powdery surface on which paint adhesion is poor; this may not always be visible at the time of painting. If moisture later gains access, delayed expansion can then cause severe blistering or breaking up of the plaster.

Class D Keene's plaster This is similar to Class C plasters and can be trowelled to a smooth level surface especially suitable for gloss finishes although this sometimes leads to poor adhesion for paint. It may be alkaline or slightly acid in reaction; in either state it is itself unlikely to affect paint. It should not be gauged with lime, but in the presence of lime, (from the backing for example), it may become strongly alkaline. The traditional practice of 'following the trowel' with a sharp primer (one with a low oil content) is intended to ensure full hydration and improve paint adhesion, but it is becoming less common and should be used only on Keene's cement which shows an acid reaction on test.

Lightweight plasters

BS 1191 Part 2 *Premixed lightweight plasters* describes two types, (a) undercoat plasters and (b) finish plaster. They confer good fire-resistance and their good thermal insulation and ability to absorb some moisture help to reduce intermittent condensation although, if this property is needed, impervious paints should not be used. In one product ('Carlite'), both undercoat and finish are based on retarded hemi-hydrate gypsum plasters, with added lightweight aggregate such as perlite or vermiculite (or both in final coat plasters). Both contain small amounts of free lime (greater in the metal lathing and browning types) and are slightly alkaline. Being more porous than other gypsum plasters they hold more water initially and may take longer to dry out, particularly in winter; adequate drying out is essential if paints are not to be affected. On a background liable to produce stains or efflorescence, an aerated sand/cement backing coat is desirable. Patchy absorption of emulsion paint can result from uneven trowelling as with Class B, accentuated by the slower drying out, and successive coats may 'pile up' on the more absorptive areas rather than even them out. A thin, non-aqueous paint or sealer is necessary to overcome this difficulty.
Another product ('Limelite') has an undercoat based on Portland cement and lime with lightweight aggregate. It resists movement of water and salts but is highly alkaline; precautions may need to be taken against alkali attack on paints.

Thin-wall plasters

These are based on organic binders and set only by evaporation of water; being used in thin layers they dry out rapidly. They should present no difficulty in painting if the background is dry but occasionally appear underbound and excessively absorptive even to the point of being softened by emulsion paints. A sealer coat may be necessary.

Dry lining

Dry finishing systems with paper-faced plasterboard and jointing compounds are usually finished with emulsion paint and give little trouble except for occasional excessive absorption by the jointing compound giving a patchy appearance or even severe cracking of the paint. Appropriate sealers should then be used. Spray painting is especially appropriate and some solvent-thinned paints, such as high-build chlorinated rubber or synthetic rubber types, may be used in cold weather.

Wallpaper This is a fairly common base for painting, usually with emulsion paints. It may give rise to 'bleeding' with a few colours or with 'gold' (bronze) pigments in the paper. Some paints weaken the adhesion of the wallpaper by their drying shrinkage, causing occasional failures, and in very dry weather the additional shrinkage of the wallpaper (especially heavily-embossed types) can cause widespread detachment. Vinyl wallcoverings seem to be readily coated with emulsion paint and less prone to such failures.

Portland cement rendering

The alkalinity of Portland cement is, with rare exception, so high that precautions against alkali attack of paints by new cement-based products should always be taken. Because of the caustic alkali present, carbonation of the lime content on aging is not always sufficient to prevent the saponification of oil-paints and even when the surface pH falls to about 9, there may be further alkali at a greater depth which will affect paints as moisture moves through. The free lime usually present in cement plasters is a cause of the lime bloom which is particularly noticeable on emulsion paints. If carbonation is allowed to occur before painting it can greatly reduce this effect and also reduce surface porosity.
Cement paints are suitable for very early decoration;

acrylic emulsion or other alkali-resistant porous paints can be used after about four weeks drying. For a glossy finish, a non-saponifiable paint (for example chlorinated rubber) is preferred; an alkali-resistant primer is essential under oil-based paints but the moisture content must be at a safe level. Chemically-resistant wall finishes require a hard base: cement rendering is normally suitable if dry but if a very smooth finish is needed, an anhydrous plaster can be used on top.

Concrete

Concrete is considered a durable, permanent material but long-term deterioration, especially in acid-polluted air, is possible; it may, therefore, require protection. Following deterioration and repairs, or even when new in the absence of sufficient cover to protect reinforcement, there is often a requirement to provide protection against penetration by water and salts. There is also an increasing need for decorative or colouring treatments to improve the quality of the surroundings where these contain large areas of concrete, or even for colourless waterproofing treatments to prevent accumulation of dirt and biological growths.

The general requirements for painting concrete are similar to those for cement renderings but the surface may be either hard and smooth with poor adhesion for paints (eg pre-cast components) or rough and porous with large voids, as in mass concrete. Residues of mould oil can seriously reduce paint adhesion; they are best removed by abrasion rather than solvents but detergents or emulsifying agents may be useful. The application of cement-based paints, or 'bagging' with a cement/sand mix, will reduce surface roughness. Larger voids may be filled with mortar or epoxy-resin mortars, or, *indoors in dry conditions only*, with gypsum plaster or water-mixed powder fillers. Alternatively, thin-wall plasters (indoors) or textured paints (either indoors or out) may be used to hide surface blemishes.

The coatings needed to provide additional protection must be impervious and should therefore be applied when conditions are as dry as possible but their effect in reducing the rate of corrosion of reinforcement is far from reliably established and no firm guidance is available on the acceptability of such a treatment in place of additional concrete; they will need periodic maintenance.

Stucco

New stucco, and repairs to cracks with Portland cement mixes, should be treated as an alkaline cement rendering. Problems also arise from the weak or friable condition of old stucco, the presence of hair cracks and of multiple coats of paint of doubtful adhesion. Many paint failures begin at cracks which re-open and allow water to enter. Cracks over 2 mm wide should be cut out to at least 20 mm and filled with a masonry cement or cement/lime/sand mortar. For finer cracks, an exterior grade of elastic oil-bound stopper (available from very few suppliers) is necessary; many water-mixed fillers are unsuitable but those based on emulsion binders, or made up from a cement/sand mix and emulsion paint, may be suitable under emulsion-bound coatings. Failures may also occur at a weak layer in the existing paint even when it appears sound, as a result of the drying shrinkage of the new paint; sealers are usually recommended but must not be expected to penetrate multiple layers of old paint and bind them down to the surface.

Suitable gloss paints are difficult to obtain: the possibilities are discussed in the section on gloss finishes for exterior use. Where a gloss finish or smooth surface is not essential, some fine-textured exterior emulsion paints or exterior masonry paints can be used on old, painted stucco and on new work. The old paint should be thoroughly cleaned by wet abrasion.*

Asbestos cement sheets

When new, asbestos cement sheets are strongly alkaline. They vary in porosity between different types and even over the area of single sheets. Emulsion paints are suitable if based on alkali-resistant polymers; the first coat should be well thinned to avoid patchiness on new sheets, and if this does not overcome the difficulties a solvent-thinned sealer should be used. If a glossy finish is required, chlorinated rubber paints would be preferred to the more complex system of alkali-resistant primer, undercoat and gloss. Asbestos cement should not be painted with an impervious finish on one side only since differential carbonation may result in warping or cracking; back painting with the same paint or a cheaper impermeable one is necessary. Asbestos insulation board is less dense and much more porous than asbestos cement, and also less alkaline. A coat of sealer is almost essential under any type of paint. For exterior use, conventional paint systems do not provide sufficient protection and manufacturers' recommendations should be sought.

Brick and stone

These vary considerably in porosity from almost non-porous granite, marble and engineering bricks, to the quite absorptive surfaces of sand lime bricks and (in parts) Flettons. If engineering bricks, glazed bricks or non-porous stone have to be painted, a strongly adherent paint is preferable such as chlorinated rubber, epoxy ester ('tile' paints) and the two-pack epoxy or polyurethane paints. There may be variation between adjacent areas of the more porous materials, necessitating thin, penetrating first coats. Emulsion paints differ in their

* Further information on stucco can be found in 'The maintenance and repair of regency painted stucco finishes', G E Bessey, RIBA Journal, Feb 1950, pp. 143–5.

Table 1 Types of paint and coating for interior and exterior use
(durability is for average situations and sound surfaces)

Type	Durability outside (years)	Performance indoors	Other comments	Repainting	Stripping	Alkali resistance	Vapour permeability
Water-thinned							
Cement paints	5–7; soil quickly and erode rapidly in highly acid atmospheres; prone to algal growth in wet areas	Unsuitable on gypsum plaster Rough surface	Pastel shades may whiten outside; dark shades often become patchy	No special restrictions but if cement paint is used manufacturers' recommendations must be followed; may need a sealer with emulsion paints	No entirely satisfactory method: mechanical methods best	High	High but will reduce rain penetration of porous materials
Emulsion paint: general purpose good quality	Approx 3	Fairly good opacity washability, wear resistance	Various copolymers, not all of same properties; some types unsuitable in kitchens and bathrooms	Emulsion paint or oil-based paint	Thorough soaking softens many types (using detergent or wallpaper-removing paste may help); a few are removable with solvents or solvent paint removers; steam stripping for large areas; mechanical sanding if in bad condition	Low	High
Emulsion paint: matt or 'contract' lower quality	Unsuitable	High opacity at some loss of washability		As above		Medium	Very high
Emulsion paint: exterior, smooth	4–7		Acrylic, styrene/acrylic and pva/versatate copolymers	Same or textured		Should be high	Medium
Emulsion paint: exterior sand-textured or fibre filled	4–10, partly depending on film thickness; fibres not always beneficial		Thicker films than other emulsion paints, about 100 μm; fine texture; binders as above	Same		High	Medium
Emulsion paint: ('vinyl') silk, satin or gloss	Not normally used; some gloss types may be but experience limited	Opacity decreases as gloss increases; silk and satin claim good resistance to washing	'Vinyl' appears intended to relate to superior quality rather than composition	Emulsion paints and vinyl paints		Low or medium	Low or medium
Bituminous emulsions	1–10 depending on thickness and composition. May have decorative and protective top coat	The better ones are useful waterproofers and adhesives but few are decorative	Available in a few dark colours as well as black; decorative emulsion paints are available for covering	Bituminous emulsions	Possibly steam strippers	High	Low
Textured 'plastic' paint	Unsuitable	Adequate, may need top coat	Dry powders based on gypsum plaster. Ready mixed based on emulsion. Hand-worked or sprayed	Oil paint or emulsion	Soak with water and scrape. Do not abrade dry	Low	Medium
Textured or coarse mineral aggregate filled emulsion coatings (including 'organic renderings')	Over 10; some may show dirt in polluted areas	Useful for bold textured effects; some very rough others more rounded with smoother surface; opaque or translucent	Variety of textures; applied by brush, roller or trowel. Up to 2 mm thick, hence high material cost but low labour cost	Emulsion paint	Soaking or steam stripping	High	Medium

Solvent-thinned

Gloss paint and enamels (mainly alkyd resin based)	3–6 mainly on old painted walls including cladding; oil-based masonry paints preferred on stucco	Satisfactory; hard wearing and easily cleaned; gloss makes uneveness more conspicuous	Most good quality paints used outside and inside; also cheaper 'interior only' qualities. BS 2525–7, lead-based paints, withdrawn	Oil-based paints; possibly 'vinyl' silk, satin or gloss emulsion paints in dry conditions indoors	Solvent or alkaline paint removers Burning off possible on thick layers Mechanical methods	Low	Low
Polyurethane (one-pack)	3–4 (usually too hard) for wood or stucco)	Better wash and wear resistance than alkyds				Medium	Low
Flat oil paint	2–3; not generally suitable	Satisfactory; some may 'polish' on dry rubbing but resistance to washing usually good	Few examples now available	Oil-based paints; emulsion paint in dry conditions		Low	Medium
Imitation stone paints	5–10	Satisfactory but a rough finish	Formulations and properties vary; usually contain fine sand, stone or mica bound with varnish	Same type; oil paint and emulsion paint	Mechanical methods or solvent paint removers	Low	Medium or low
Exterior masonry paints (smooth, matt or semi-gloss)	4–7		Based on isomerised or synthetic rubber, vinyl or 'acrylic' resins	Same type	Some paint removers; consult maker if known	High	High
Chlorinated rubber (masonry) paints	4–7	For special purposes only, eg water, acid or alkali resistance (not resistant to oils and solvents); moderate gloss	Exterior and interior types may differ; high-build types preferred	Chlorinated rubber paint	Naphtha Consult maker for special strippers	Very high	Very low
Epoxy ester paints (one-pack)	3–5; not often used; sometimes as primers	For special purposes only, eg water, acid or alkali resistance; usually glossy finishes	Rather better water and chemical resistance than hard gloss paints	Same type	Solvent paint removers	High	Low
Textured coatings, sprayed or roller applied (not emulsion)	10 or more, some with guarantee; some claim 20 years without actual evidence of use	Rarely used	Mainly alkyd (polyester = alkyd); chlorinated rubber; some described as 'acrylic' or other polymer; thick films (0.6–1.0 mm); initial cost often very high, overall cost in long-term may be high but appearance very good	Emulsion; masonry paints but not chlorinated rubber; same type	Mechanical methods; solvent paint removers will attack but large quantities needed for thick films	Low	Medium
Mineral aggregate coatings (ready-mix or aggregate applied to an adhesive base coat)	10, best types may be more	Used for special effects; opaque or slightly translucent	Coarse grit, minerals or coloured glasses, premixed with a polyurethane, epoxy or other binder (now rarely oil-based) or applied to tacky bitumen or other adhesive	Oil-based paints or emulsion	Mechanical methods	Medium	Medium
Chemically cured paints (epoxy and polyurethane based 'aliphatic' type for good colour retention)	3–10 depending on thickness; best types should exceed 10 years	For maximum water, chemical and solvent resistance and hard wear	Two components to be mixed just before use; special uses on concrete	Same type; adhesion of subsequent coatings may be poor	Solvent paint removers rarely effective; mechanical methods	High (some pu are low)	Very low
Multicolour paints (emulsion-based examples also available)	No experience; consult maker for suitability	Very hard-wearing	Helps to conceal uneven plaster and dirty marks; mainly spray application	Same type	May soften with solvent paint removers; possibly steam stripping	Medium	Low
Bitumen paints (solution type) Tar paints (solution type)	2–4 depending especially on exposure to sunlight	Useful waterproofers, especially below ground level, but not decorative	Bitumen paints give better outdoor life if final coat is pigmented with aluminium	Bitumen or tar paints	Solvent naphtha will soften and dissolve but mechanical methods often better	High	Very low

adhesion to Fletton bricks, but the determining factors for this have not been investigated sufficiently to make recommendations. Solvent-thinned exterior masonry paints generally show poor filling qualities and fail by flaking. Adhesion of all paints is much better on sand-faced bricks. Soluble salts are present in some types of bricks and cause efflorescence.

New and repaired brick and stone work will require alkali-resistant paints because of the presence of Portland cement mortar.

Choice of paint system

Although colour and appearance are usually the prime considerations when choosing paint, the surface characteristics of the wall and the presence of moisture, alkali and salts must be taken into account. In addition, the overall cost in use, determined by the expected life and maintenance requirements, should play an important part except in the simplest situations. As well as paints with a total thickness of about 0.05 to 0.1 mm for two to three coats, a variety of thicker coatings is now available, sometimes described as 'organic' plasters or renderings, or 'textured' or 'plastic' coatings.

Many paints are applied over primers or sealers which may modify the properties, especially the permeability, of the finish. Although it is desirable to use sealers as directed by the manufacturer, some examples examined at BRS have proved unsuitable or even incompatible with their finishes. In particular, emulsion-based 'sealers' do not penetrate well into masonry and may lead to adhesion failures of finishes of low permeability.

Where Building Regulations require a specific fire performance for walls, coatings must be chosen from those specially modified and certified to have the necessary surface spread of flame classification. A list of these, on various substrates, has been prepared[1] by the Fire Research Station, Borehamwood, Herts WD6 2BL and manufacturers will supply copies of their certificates.

Interior use

Matt finishes These are most commonly used as they reduce the reflection of light sources and minimise the effect of surface irregularities. They are less suitable than gloss finishes when high wear resistance, ease of cleaning or maximum hygiene are desired. Matt paints in general are more permeable to water vapour than glossy ones (but a matt oil paint is less permeable than a matt emulsion paint) and mild condensation is generally less obvious than on glossy surfaces.

Emulsion paints are based on a variety of polymer binders; their general properties are dependent on many factors other than the nature of the binder. General purpose types may have a slight sheen but satin or silk emulsion paints are now available with the same advantages in ease of use (including water cleaning of brushes). Emulsion paints are moderately resistant to cleaning and this may increase with the degree of sheen. Because they are known to be permeable and usable when walls are not completely dry, they are often misused and applied within days of plastering. The glossier ones are least permeable and it is better not to use them for first decoration. Although relatively trouble free, emulsion paints occasionally give rise to difficulties with efflorescence or patchiness on plastered walls, in which case a penetrating sealer must be used first. A flat oil paint, or a sealer followed by more emulsion paint, can be used over the faulty paint film.

Better general dirt and wear resistance is achieved with oil-based (eg alkyd) matt finishes, but these are now rarely used; they require more skill in application and an alkali-resistant primer on most new surfaces. They are also more likely to yellow with age than emulsion paints. Types which are claimed to allow brush cleaning in water have recently been introduced.

Gloss finishes Alkyd gloss paints (used over undercoats and alkali-resisting primers where necessary) are suitable for moderately difficult conditions where good wear and washability are required; the one-pack polyurethane gloss paints are somewhat better. The latter may not need a special primer as they are fairly resistant to alkali. For industrial purposes (canteens, kitchens, food factories and in conditions of moderate chemical pollution) the chlorinated rubber paints would be preferred to oil-based paints; for the heaviest duty and specific chemical resistance two-pack epoxy and polyurethane paints are desirable but considerably more expensive in both materials and labour. They are best used on a hard rendering rather than, for example, lightweight plasters but are unsuitable over most types of existing paint system.

Water-thinned (emulsion) gloss paints continue to be developed but suffer from rather low opacity, low tolerance to poor application conditions (whether too damp or too dry) and are likely to be less resistant to wear than the oil-based paints.

Exterior use

Thorough surface preparation and a thick film, as well as the correct choice of coating, are essential for good performance.

Matt finishes Emulsion or solvent-thinned synthetic polymer paints (both often described as masonry paints) should be used; a life of up to 5 years is likely from both types. Oil based matt paints are not sufficiently durable outdoors.

Gloss finishes These are not often used on walls except of stucco. The lead-based gloss paints commonly specified for stucco are toxic and are considered by some to be undesirable; since BS 2525 was withdrawn they have not been generally

available. Oil-based masonry paints (with little or no lead pigment) are available from some manufacturers, but the ordinary alkyd gloss paints give thin films and last only three or four years. For concrete, glossy, two-pack polyurethane paints have been used; chlorinated rubber paints are also suitable where their semi-gloss finish is acceptable.

Textured finishes These are the most widely used exterior wall coatings and cover a wide range from the very fine sand or stone textures to those containing coarse aggregate or worked into patterns by rollers or hand tools. Although even the coarsest texture is not visible above two or three storeys, the greater durability of these coatings is a valid reason for their use. There is still considerable use of the old established stone-textured paints based on oleoresinous media, with sand or mica fillers, which have a useful life of around seven years, giving a reasonably economical balance between first cost and maintenance. About the same life is obtained from exterior emulsion based paints of similar texture.

Thick, textured, sprayed coatings (about 0.5 to 0.8 mm), usually based on 'polyester' (ie alkyd) resins with mica, perlite and sometimes fibres, have a life likely to exceed 10 years if correctly applied. Some are described rather incorrectly as 'plastic'. There are also somewhat similar types of coating based on oil-free polymers, chlorinated rubber or emulsions. Most sprayed textured coatings are offered with a 'guarantee' by specialist application contractors, which, although limited to the behaviour of the coating in specified ways, can be a useful feature if the operators or manufacturers are known to be of good standing and with several years background of successful applications. Nevertheless, at best, these expensive treatments may not show the lowest overall 'cost in use' over a long period on domestic buildings, for which the most economical treatment is probably with masonry paints at about half the cost of the textured coating and half the life. The longer life coatings have useful advantages on buildings where application costs are high or there is a requirement for a high standard of appearance or better resistance to rain penetration for which extra cost can be justified. Also, the possibility of eventually recoating the original textured coating with a thinner masonry paint would lower the calculated cost in use.

The thick, textured coatings can also contribute to the rain resistance of an external wall but are too thin to substantiate claims for acoustic and thermal insulation properties except that by reducing the moisture content of the wall they would prevent the reduction of its original thermal insulation value.

There will probably be an increasing use of recently-developed, coarse-textured, emulsion-bound treatments applied mainly by roller, widely used on the continent where they are described as 'organic renderings'. These produce films 1 to 2 mm thick and can be given a variety of textures by the method of working, including the 'scraped 'or 'scratched' type which contains particles of 2–3 mm but the film is often very thin in the scratched areas. Although expensive in materials they are low in labour costs. Their durability is not yet fully established in Britain but is likely to be in excess of 10 years; there could be excessive dirt pick-up in polluted atmospheres or softening in very wet situations, near the foot of walls for example. At a thickness of 1 to 2 mm they can barely hide normal joints in brick and blockwork, but it may be possible to use those with good resistance to rain penetration without a preliminary cement render coat, making them more economical. Other forms of emulsion-based thick coatings, applied by spray or trowel, contain mineral or glass particles in a clear binder with no pigment, giving a translucent or multi-coloured effect. These also have a life likely to exceed 10 years, with similar reservations as to dirt pick-up.

Surface water-proofing treatments These may be used where rain penetration has been established as the cause of dampness (rather than condensation or rising damp) but for extreme exposure and minimum maintenance some form of light cladding may be preferred. Coatings should be applied only after cracks and defects have been repaired.

Silicone and other colourless water-repellents are useful on exterior wall surfaces in good condition when the appearance of bricks or stone is required to be maintained rather than hidden by paint. When used in adequate strength (eg not less than a five per cent solution for silicones) they can be effective for up to 10 years. Much of the rain penetration of brick walls occurs at the mortar joints and water-repellents will not always seal these fine cracks, nor the larger visible cracks which may develop; water shed from treated parts tends to run into cracks and may make the situation worse. Clear solutions of acrylic resins may also be used for water-proofing and could be more effective where there are fine cracks but they tend to have more effect on the colour of the surface and slightly more restriction on the evaporation of water from the wall. The durability of such treatments is difficult to predict, being partly dependent on the depth of penetration, but the clear surface layer may last only a few years. Clear polyurethane water-proofers have not shown satisfactory durability.

Pigmented coatings form a better barrier to rain with, in general, a longer life. The thicker masonry coatings and especially the sprayed textured type are reasonably effective although some mineral-filled emulsion coatings may shed light rain but allow penetration by driving rain over long periods, as do water-repellents. One much-used system is a

bituminous emulsion water-proofing coat followed by a specially-formulated decorative exterior emulsion paint. Another consists of a pigmented rubbery polymer, producing thick smooth decorative coatings (sometimes described as liquid plastics) with a life expectancy of over 10 years on walls and good crack sealing properties until they eventually embrittle. Some treatments include a reinforcing glass or synthetic fibre cloth to improve performance at cracks and joints.

Attempts to seal walls on the inside are usually less successful than external treatment, but the various proprietary compositions sold for this purpose can be useful against moderate or intermittent dampness. Some are based on a polyurethane formed by reaction with moisture in the wall but the amount of moisture they take up in very small; their performance has not been studied by BRE. If moisture in the wall cannot escape by another route, impervious coatings are liable to be disrupted; possibly the most useful application is where the dampness has brought out stains, on chimney breasts for example, which would effect other paints and have to be sealed.

Walls below ground should be sealed on the outside before backfilling; bituminous compounds and emulsions are effective, economic and durable. On the inside face most coatings are unsuitable when water has already penetrated; some proprietary treatments using rapid setting cements in conjunction with overall coatings are claimed to be effective. BRE has no experience of these materials but the makers should provide examples of use.

Reference

1 Results of surface spread of flame tests on building products; BRE Report; HMSO; £6.00

Further Reading

British Standards Institution, London

BS 1191 Gypsum building plasters:
Part 1: 1973: Excluding premixed lightweight plasters
Part 2: 1973: Premixed lightweight plasters

BS 5262: 1976 Code of practice for external rendered finishes

CP 211: 1966 Internal plastering

CP 231: 1966 Painting of buildings

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